

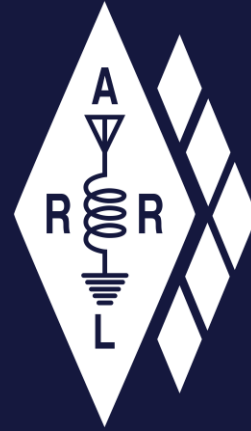
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On the Air Live: 10M and 15M FT4 and FT8 for Field Day

wgreene@ARRL.org

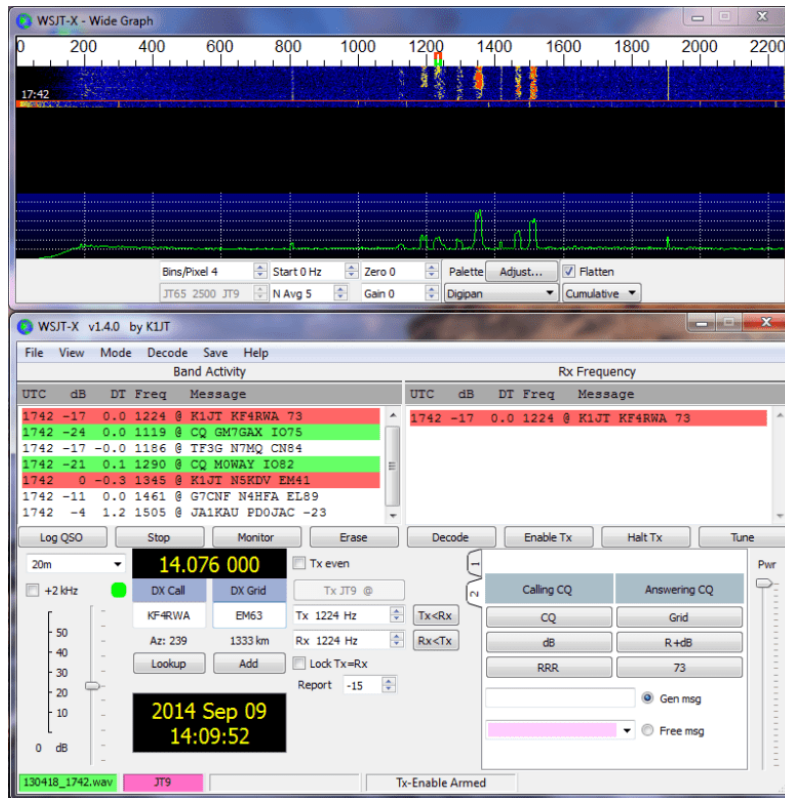


ARRL
The National Association for
Amateur Radio®



To Cover

- 10M and 15M Propagation
- Propagation Tools
- DIY Antennas
- How FT4 and FT8 Works
- Setup WSJT-X
- FT8 and FT4
- Field Day Setup

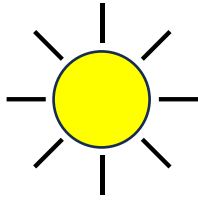


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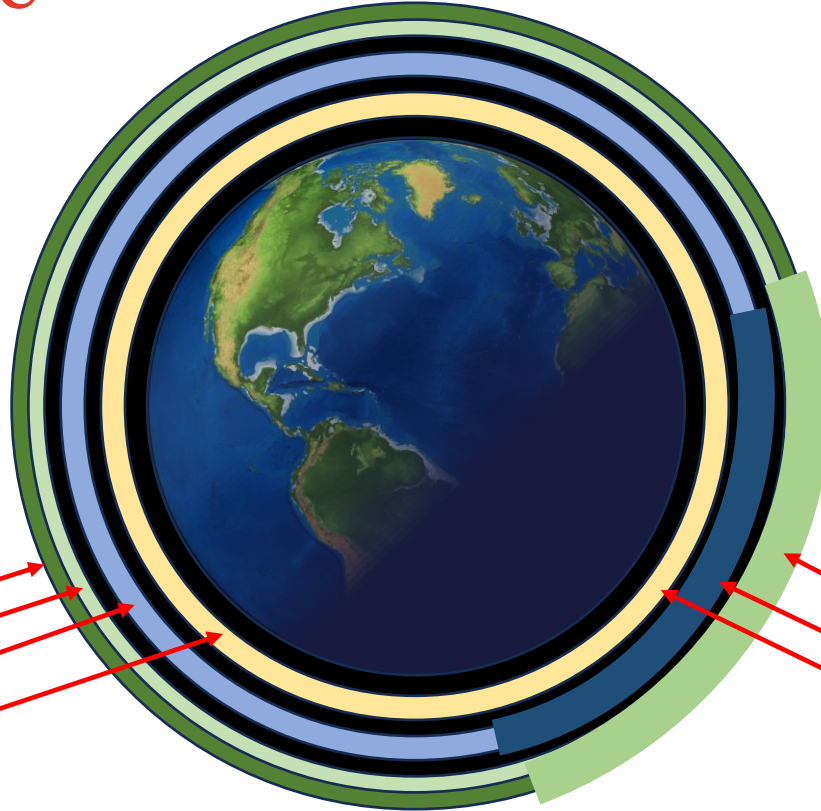


Ionosphere

F Layer: 100-240 miles



F2 layer propagates
HF during the day.



At night, F1 layer
fades and merges
into F2 layer.

~2500 mile hops



F2 Layer

F1 Layer

E Layer

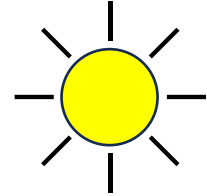
D Layer

F Layers combine

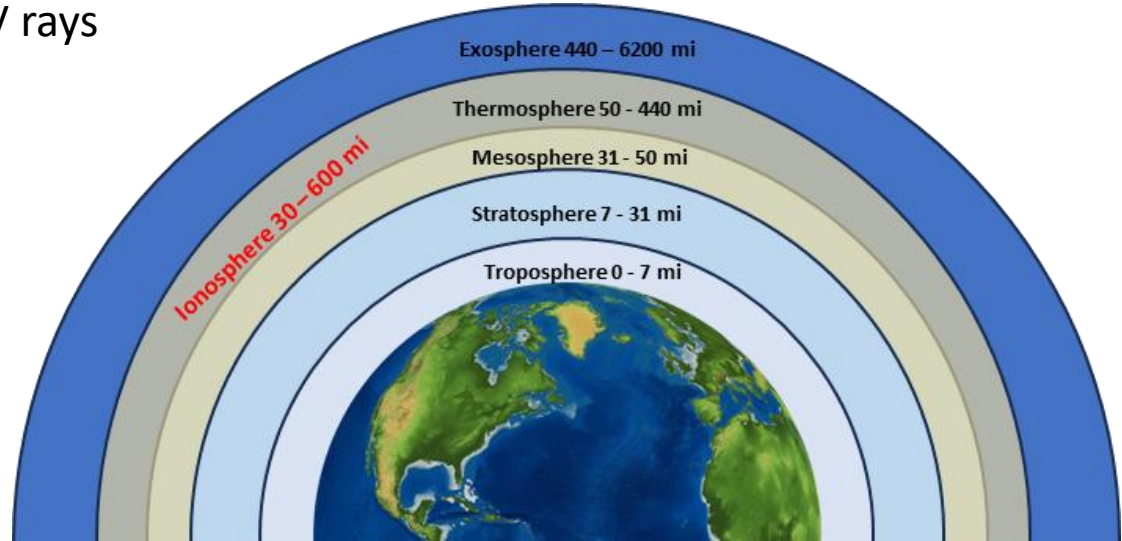
E Layer weaker

D Layer dissipates

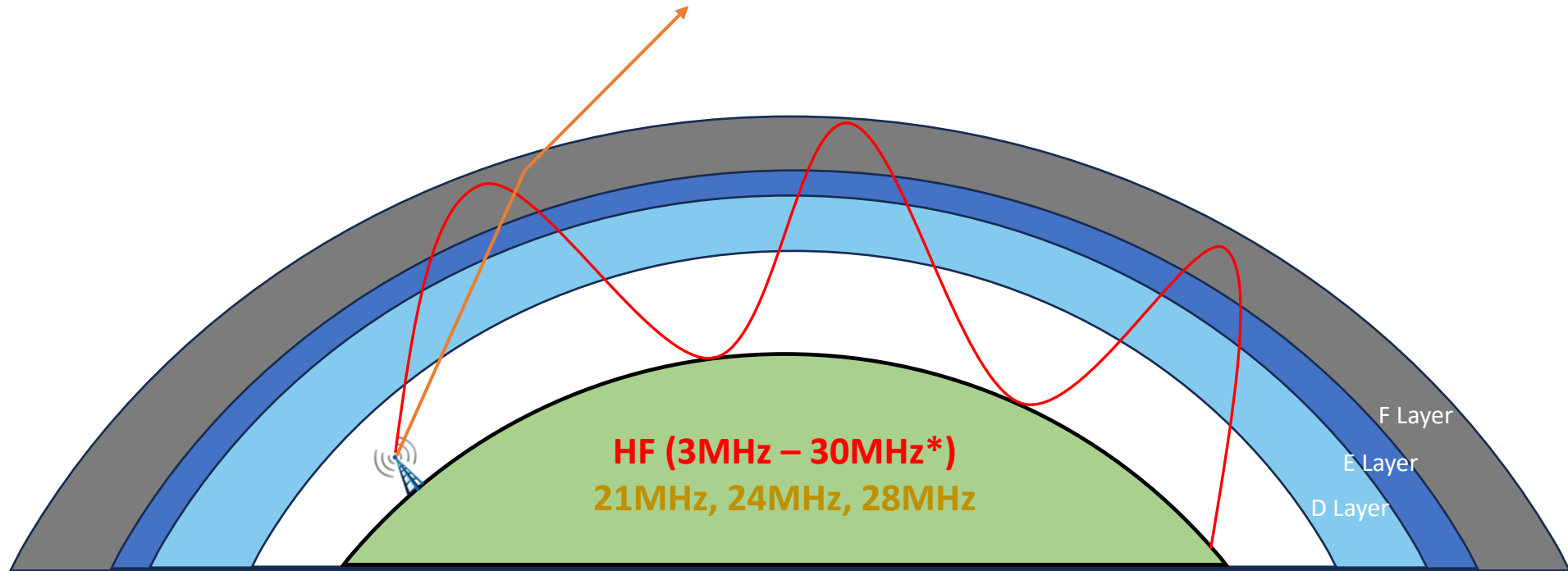
10M and 15M Propagation



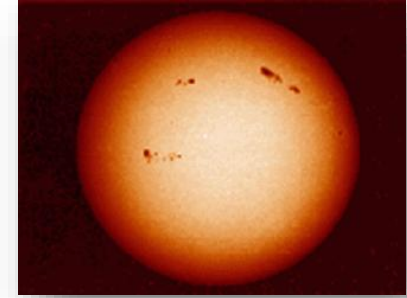
- Ionosphere:
 - Portion of atmosphere
 - Ionized by sun's UV rays



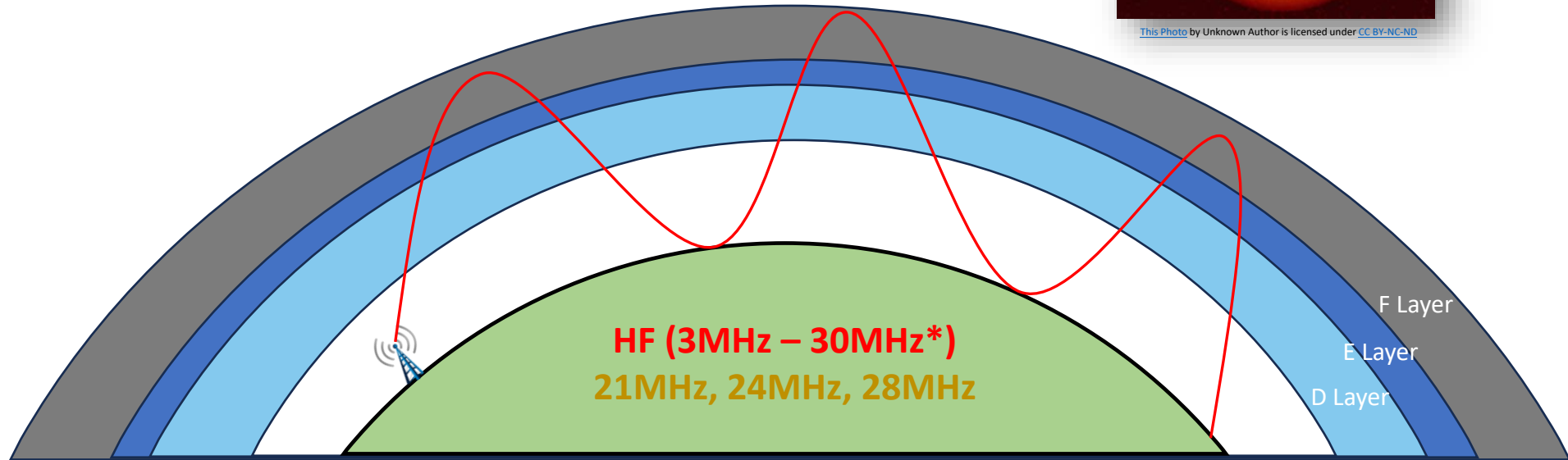
10M and 15M Propagation



10M and 15M Propagation High Solar Activity

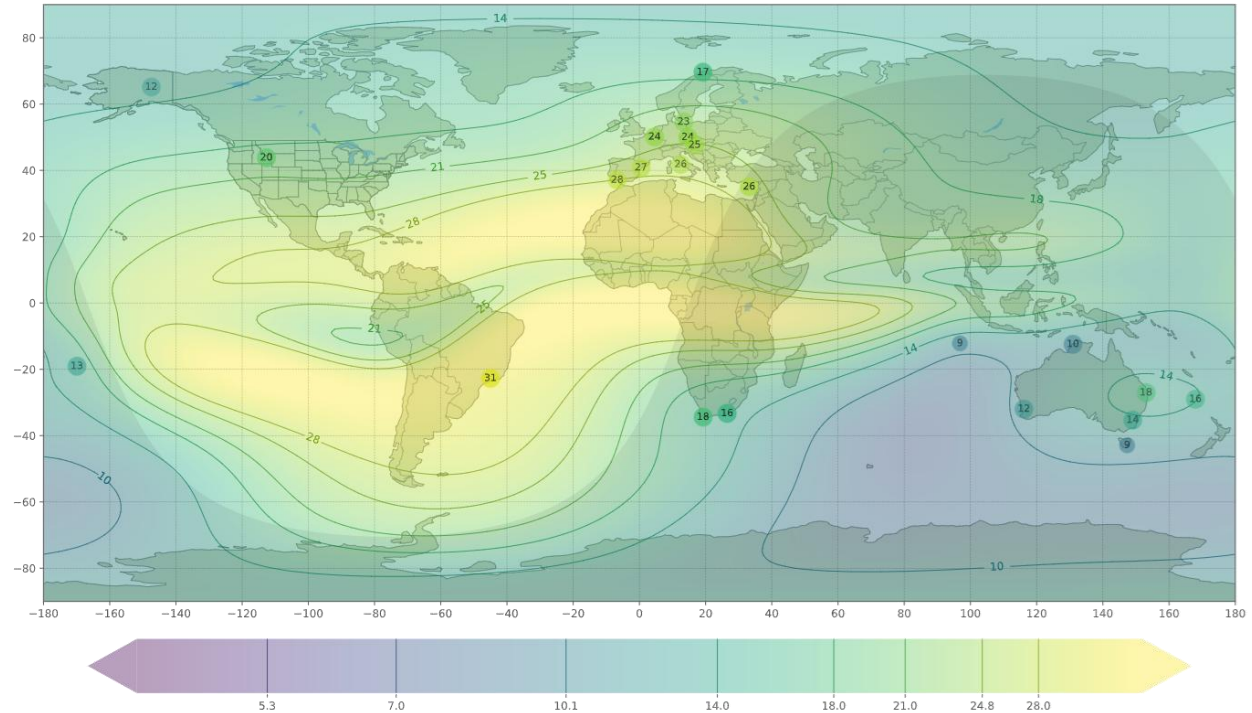


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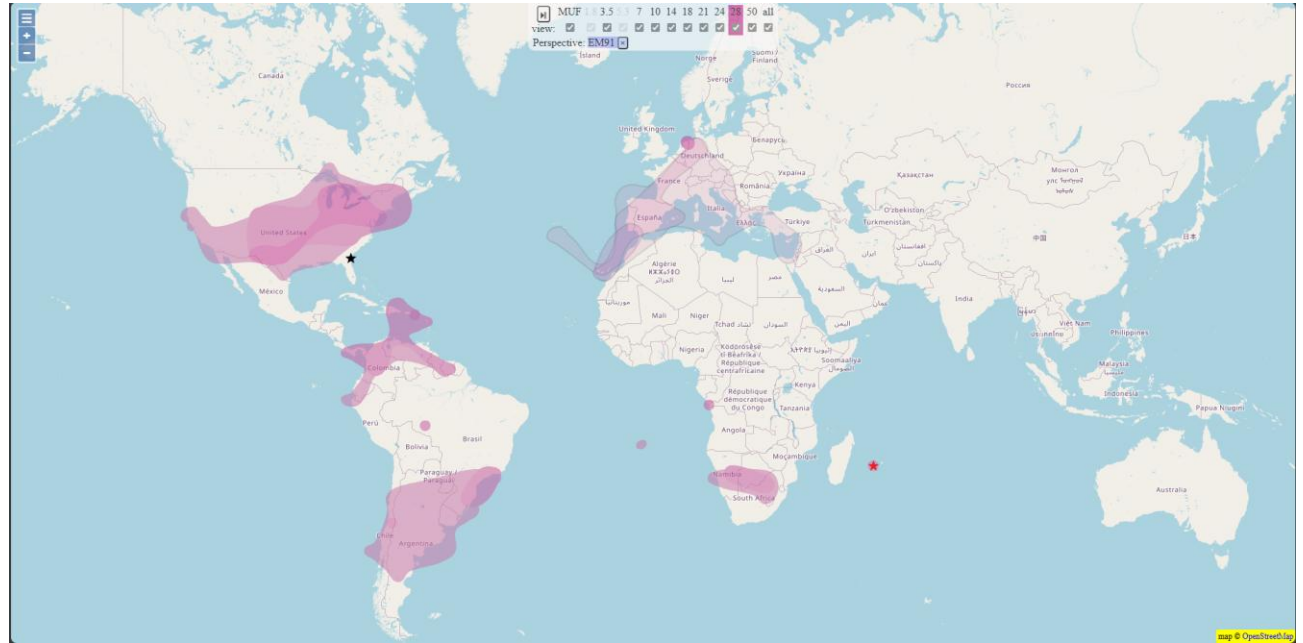
10M and 15M Propagation

- prop.kc2g.com/
- Maximum Usable Frequency
- 1310 EDT, May 21, 2025



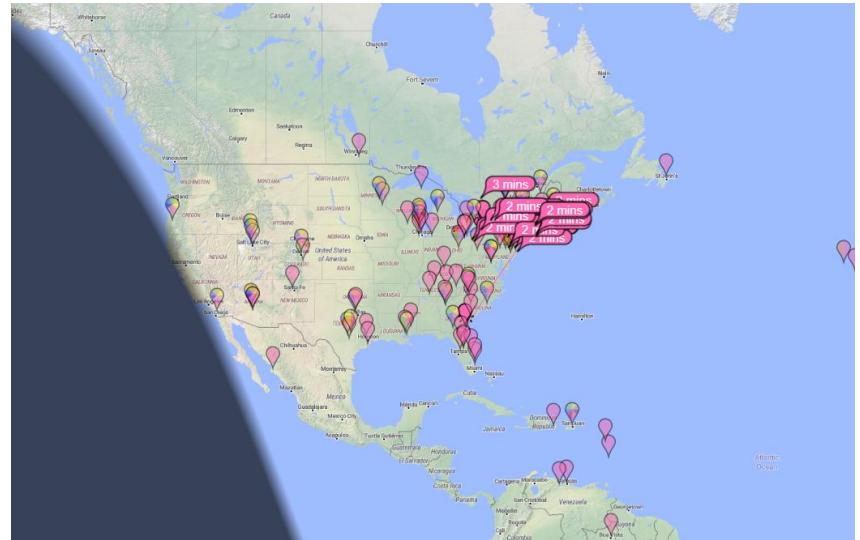
10M and 15M Propagation

- hf.dxview.org/
- Current ham activity



10M and 15M Propagation

May 21, 2025, 0856 EDT



<https://www.pskreporter.info/pskmap.html>



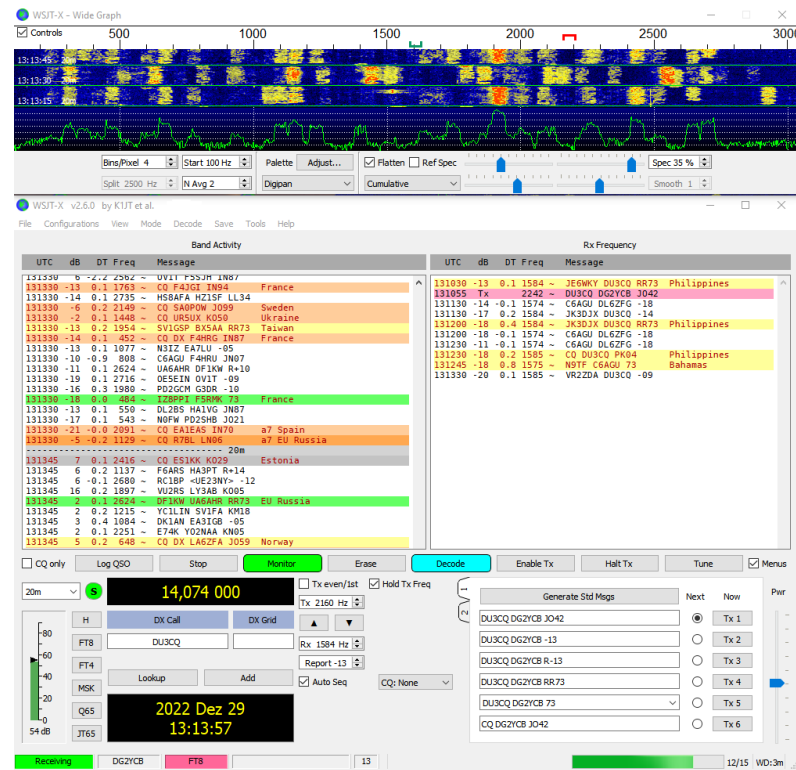
DIY 10M and 15M Antennas

- Dual banana binding post connector w/female BNC
 - Can be used to build vertical or dipole
- 18 gauge speaker wire
- Telescoping fishing rod
 - 10' and 13'
- $\lambda/2 = 468/f(\text{MHz})$
- $\lambda/4 = 234/f(\text{MHz})$
- Dipole and vertical elements
- 10M: 8.3 feet/element
- 15M: 11.1 feet/element



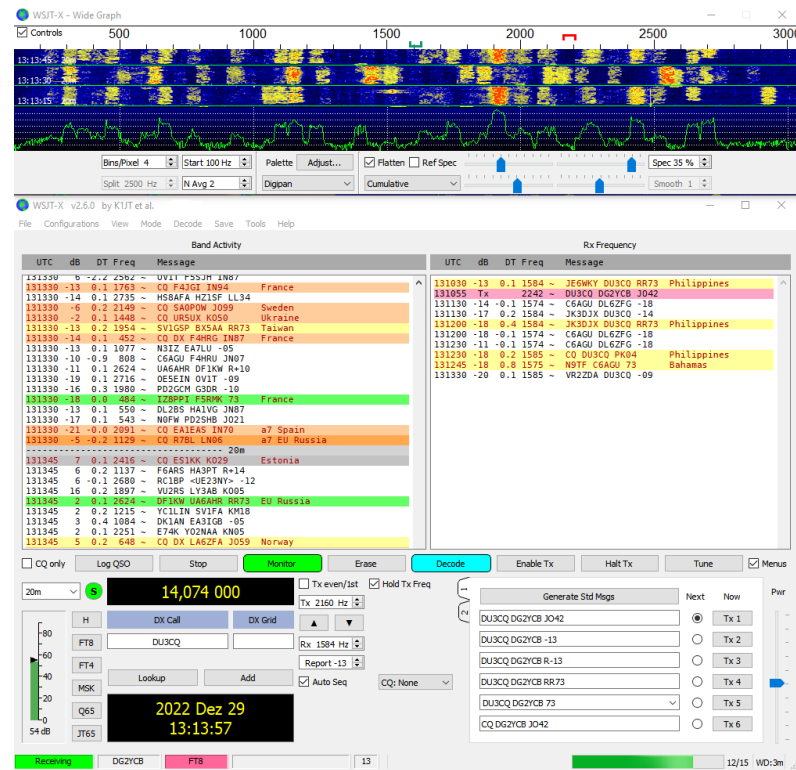
FT4 and FT8

- Sound card data mode
- Weak signal propagation
- Multiple Frequency Shift Keying
- Time dependent
 - Ensure computer's time is synchronized
- Dimension 4,
<http://www.thinkman.com/dimension4/>



FT4 and FT8

- FT8
 - 15 second T/R cycles
 - 50Hz bandwidth
 - Decodes possible up to -24dB
- FT4
 - 6 second T/R cycles
 - 90Hz bandwidth
 - Designed for contesting
 - Less sensitive than FT8, but -20dB is possible



WSJT-X

<https://wsjt.sourceforge.io/wsjitx.html>



WSJT-X



[Home](#)
[WSJT-X](#)
[MAP65](#)
[Program Development](#)
[References](#)
[Support](#)

Description

WSJT-X implements communication protocols or "modes" called **FST4**, **FST4W**, **FT4**, **FT8**, **JT4**, **JT9**, **JT65**, **Q65**, **MSK144**, and **WSPR**, as well as one called **Echo** for detecting and measuring your own radio signals reflected from the Moon. These modes were designed for making reliable, confirmed QSOs under extreme weak-signal conditions.

JT4, **JT9**, and **JT65** use nearly identical message structure and source encoding (the efficient compression of standard messages used for minimal QSOs). They use timed 60-second T/R sequences synchronized with UTC. **JT4** and **JT65** were designed for EME ("moonbounce") on the VHF/UHF/microwave bands. **JT9** is optimized for the MF and HF bands. It is about 2 dB more sensitive than **JT65** while using less than 10% of the bandwidth. **Q65** offers submodes with a wide range of T/R sequence lengths and tone spacings; it is highly recommended for EME, ionospheric scatter, and other weak signal work on VHF, UHF, and microwave bands.

FT4 and **FT8** are operationally similar but use T/R cycles only 7.5 and 15 s long, respectively. **MSK144** is designed for Meteor Scatter on the VHF bands. These modes offer enhanced message formats with support for nonstandard call signs and some popular contests.

FST4 and **FST4W** are designed particularly for the LF and MF bands. On these bands their fundamental sensitivities are better than other WSJT-X modes with the same sequence lengths, approaching the theoretical limits for their rates of information throughput. **FST4** is optimized for two-way QSOs, while **FST4W** is for quasi-beacon transmissions of **WSPR**-style messages. **FST4** and **FST4W** do not require the strict, independent time synchronization and phase locking of modes like Ebnaut.

WSPR mode implements a protocol designed for probing potential propagation paths with low-power transmissions. **WSPR** is fully implemented within WSJT-X, including programmable "band-hopping".

Latest General Availability (GA) releases: WSJT-X 2.7

WSJT-X 2.7 introduces a new program called QMAP, new Special Operating Activities Q65 Pileup and SuperFox mode, an option to Update Hamlib at the click of a button, a new program feature Message System, and a number of other enhancements and bug fixes.

Changes from earlier versions, and in particular from version 2.6.1, are described in the [Release Notes](#).

If you will use the Q65 mode, please read the [Quick-Start Guide to Q65](#). On Windows platforms, WSJT-X 2.7 also includes MAP65 3.0, a wideband polarization-matching tool intended for EME. If you will use MAP65, be sure to read the [Quick-Start Guide to WSJT-X 2.5.0 and MAP65 3.0](#).

Versions of WSJT-X labeled with a "-rcx" suffix, for example WSJT-X v2.2.0-rc6, are Release Candidates sometimes offered temporarily for beta testing purposes. You should upgrade to the GA release when it becomes available. The -rc# program versions are not suitable for long-term general use.

Installation packages for WSJT-X 2.7

Windows:

- Version 2.7.0, 32-bit: [wsjitx-2.7.0-win32.exe](#). (Windows 7 and later)
- Version 2.7.0, 64-bit: [wsjitx-2.7.0-win64.exe](#). (Windows 7 and later)

Linux:

Installation instructions for Linux can be found [here](#) in the User Guide. Download the package file appropriate for your system, from the list below. (Versions installable with "apt-get" and "yum" will be made available as soon as our package maintainers create the packages.)

- Version 2.7.0
 - Debian, Ubuntu 22 and 24, ... (64-bit): [wsjitx_2.7.0_amd64.deb](#)
 - Fedora 34, RedHat, ... (64-bit): [wsjitx-2.7.0.x86_64.rpm](#)
 - Raspberry Pi OS Bullseye, ARMv6, ... : [wsjitx-2.7.0_armhf.deb](#)
 - Raspberry Pi OS Bookworm, arm64 (64-bit): [wsjitx-2.7.0_arm64.deb](#)

Note: these packages are unlikely to install properly on Linux distributions with required dependencies at lower versions than those on the named distributions. In such cases building from source is the correct way to install WSJT-X.

Macintosh macOS:

Installation instructions for version 2.7.0 can be found [here](#) in the User Guide.

- Version 2.7.0 for macOS 10.13 through 15: [wsjitx-2.7.0-Darwin.dmg](#)

Source Code:

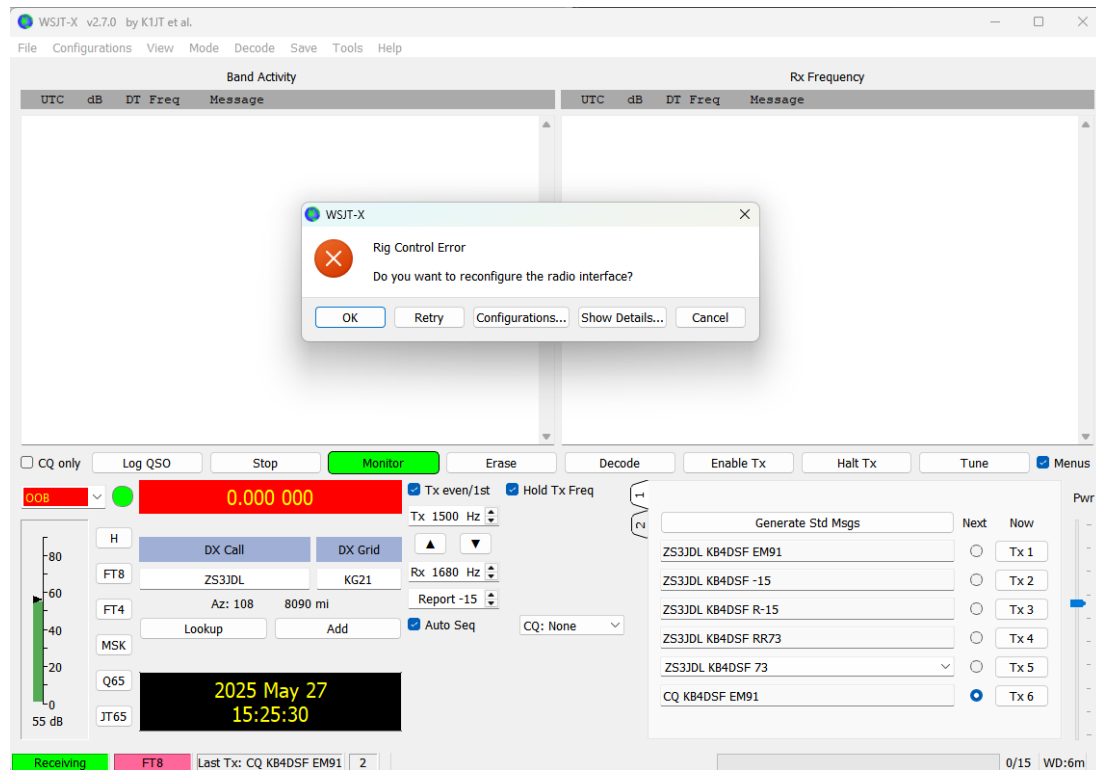
WSJT-X is licensed under the terms of Version 3 of the GNU General Public License (GPL). Development of this software is a cooperative project to which many amateur radio operators have contributed. If you use our code, please have the courtesy to let us know about it. If you find bugs or make improvements to the code, please report them to us in a timely fashion.

Build and installation instructions are in the INSTALL file inside the tarball.

- Source code and necessary resources for WSJT-X 2.7.0: [wsjitx-2.7.0.tgz](#)

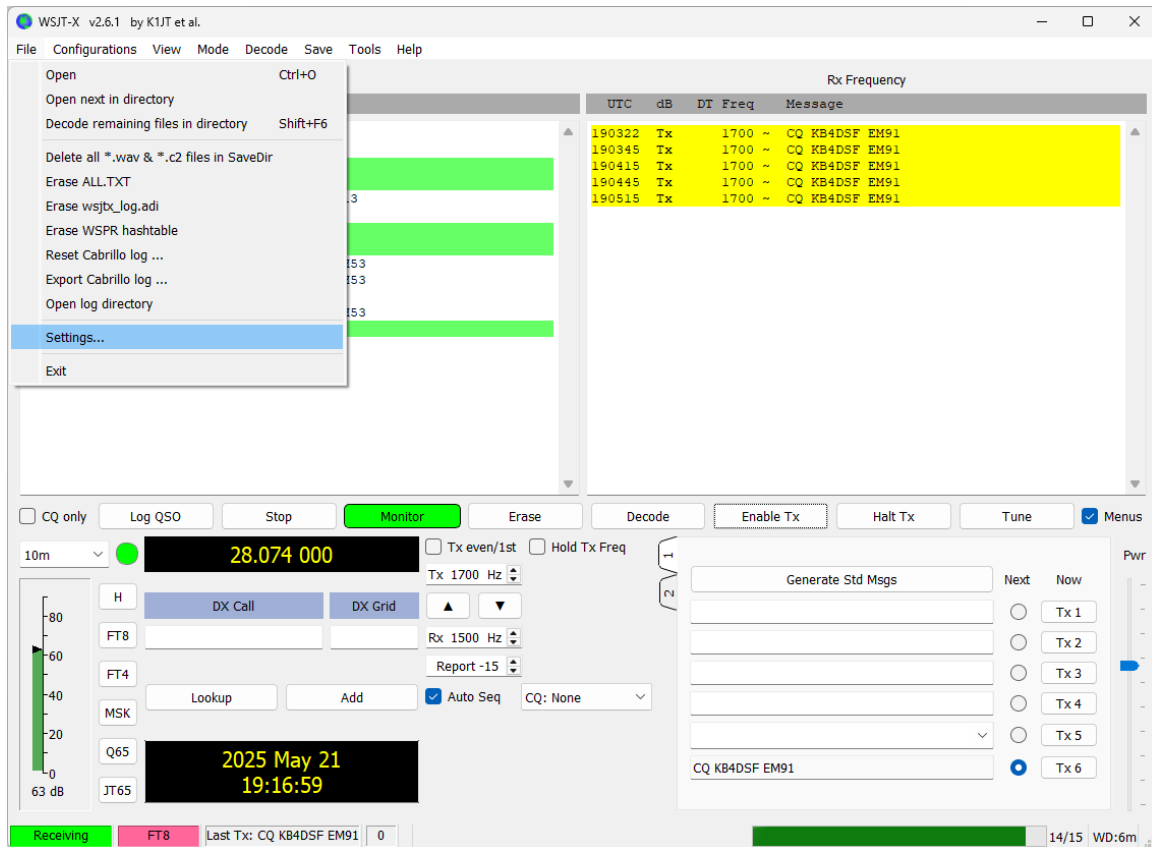


WSJT-X



WSJT-X

- File → Settings



WSJT-X

- Set callsign
- Set grid square
 - https://www.levinecentral.com/ham/grid_square.php
- Set IARU Region
 - Region 2 for the Americas
 - <https://www.iaru.org/about-us/organisation-and-history/regions/>
- Other settings are optional

General Tab

Settings

General Radio Audio Tx Macros Reporting Frequencies Colors Advanced

Station Details

My Call: KB4DSF My Grid: EM91 ☐ AutoGrid IARU Region: Region 2

Message generation for type 2 compound callsign holders: Full call in Tx3

Display

☐ Start new period decodes at top

☒ Blank line between decoding periods

☒ Display distance in miles

☒ Tx messages to Rx frequency window

☒ Show DXCC, grid, and worked-before status ☐ Show principal prefix instead of country name

☐ Highlight DX Call in message ☐ Highlight DX Grid in message

Behavior

☐ Monitor off at startup ☐ Enable VHF and submode features

☐ Monitor returns to last used frequency ☐ Allow Tx frequency changes while transmitting

☒ Double-click on call sets Tx enable ☐ Single decode

☐ Disable Tx after sending 73 ☐ Decode after EME delay

☐ Calling CQ forces Call 1st

☐ Alternate F1-F6 bindings

☐ CW ID after 73

Tx watchdog: 6 minutes

Periodic CW ID Interval: 0

OK Cancel



WSJT-X

- Select your rig
- Determine serial port and baud rate
- PTT method
 - Rig internal soundcard = CAT
 - Signalink USB = VOX
- Mode
 - USB or Data/Pkt depending on rig
- Test CAT

Radio Tab

The screenshot shows the 'Settings' window with the 'Radio' tab selected. The 'Rig' is set to 'Yaesu FT-710'. The 'Poll Interval' is set to '1 s'. The 'CAT Control' section includes 'Serial Port' (COM12), 'Serial Port Parameters', and 'Baud Rate' (38400). The 'Data Bits' section has 'Default' selected. The 'Stop Bits' section has 'Default' selected. The 'Handshake' section has 'Default' selected. The 'Force Control Lines' section has 'DTR' and 'RTS' dropdowns. The 'PTT Method' section has 'CAT' selected. The 'Port' is set to 'COM10'. The 'Transmit Audio Source' section has 'Front/Mic' selected. The 'Mode' section has 'Data/Pkt' selected. The 'Split Operation' section has 'None' selected. There are 'Test CAT' and 'Test PTT' buttons at the bottom.

Settings

General Radio Audio Tx Macros Reporting Frequencies Colors Advanced

Rig: Yaesu FT-710 Poll Interval: 1 s

CAT Control

Serial Port: COM12

Serial Port Parameters

Baud Rate: 38400

Data Bits

☒ Default ☐ Seven ☐ Eight

Stop Bits

☒ Default ☐ One ☐ Two

Handshake

☒ Default ☐ None

☐ XON/XOFF ☐ Hardware

Force Control Lines

DTR: RTS:

PTT Method

☐ VOX ☐ DTR

☒ CAT ☐ RTS

Port: COM10

Transmit Audio Source

☐ Rear/Data ☒ Front/Mic

Mode

☐ None ☐ USB ☒ Data/Pkt

Split Operation

☒ None ☐ Rig ☐ Fake It

Test CAT Test PTT

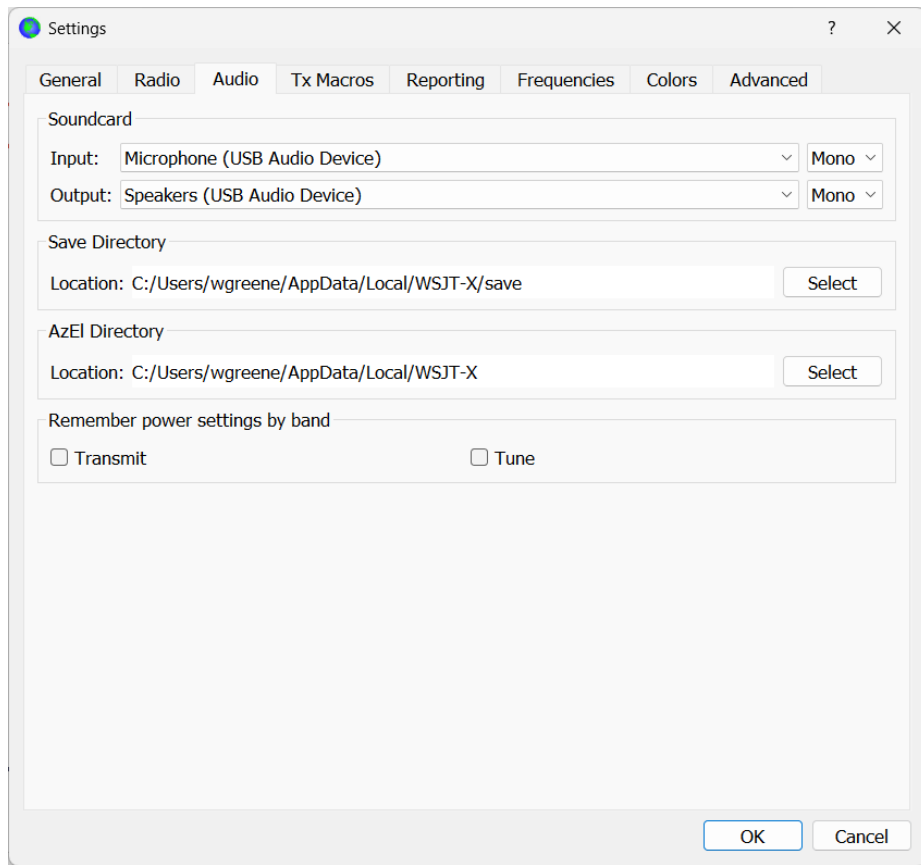
OK Cancel



WSJT-X

- Select soundcard
 - Input and Output

Audio Tab



The screenshot shows the 'Settings' window for WSJT-X, specifically the 'Audio' tab. The window has a title bar with a question mark and a close button. Below the title bar are several tabs: 'General', 'Radio', 'Audio' (selected), 'Tx Macros', 'Reporting', 'Frequencies', 'Colors', and 'Advanced'. The 'Audio' tab contains the following settings:

- Soundcard**
 - Input: Microphone (USB Audio Device) (dropdown menu)
 - Output: Speakers (USB Audio Device) (dropdown menu)
 - Both input and output are set to 'Mono' (dropdown menu).
- Save Directory**
 - Location: C:/Users/wgreene/AppData/Local/WSJT-X/save (text field)
 - Select button
- AzEl Directory**
 - Location: C:/Users/wgreene/AppData/Local/WSJT-X (text field)
 - Select button
- Remember power settings by band**
 - ☐ Transmit
 - ☐ Tune

At the bottom right of the window are 'OK' and 'Cancel' buttons.



WSJT-X

RX Frequency TX Frequency

Waterfall

Set TX Frequency

RX Frequency*

Adjust Pwr With minimal ALC

The screenshot displays the WSJT-X v2.6.1 interface. At the top is the 'Wide Graph' showing a frequency spectrum from 500 to 3000 kHz. Below it are two tables: 'Band Activity' and 'Rx Frequency'. The 'Band Activity' table lists various stations and their frequencies. The 'Rx Frequency' table lists the received frequencies for different stations. At the bottom, the 'Controls' section shows the 'Tx 1700 Hz' and 'Rx 1500 Hz' settings, along with the 'Tx even/1st' and 'Hold Tx Freq' checkboxes. The 'Pwr' section on the right shows the power level for 'Tx 6'.

UTC	dB	DT	Freq	Message
190415	-11	0.0	1105	W0R5J HK2N -04
190445	-17	0.0	1105	W0R5J HK2N BB73
190745	-20	-0.5	1470	CQ FULFAP 6599
190845	-18	0.0	1103	CQ HK2N FK31
190945	-19	-0.4	1470	EA9DHQ FULFAP -13

UTC	dB	DT	Freq	Message
190922	Tx	1700	-	CQ KB4DSF EM91
190345	Tx	1700	-	CQ KB4DSF EM91
190415	Tx	1700	-	CQ KB4DSF EM91
190445	Tx	1700	-	CQ KB4DSF EM91
190915	Tx	1700	-	CQ KB4DSF EM91

28.074 UOC

Tx 1700 Hz

Rx 1500 Hz

Report -15

Auto Seq CQ: None

2025 May 21 19:11:27

Receiving FT8 Last Tx: CQ KB4DSF EM91 0

12/15 WD:0m



WSJT-X

Live Demonstrations

LIVE DEMONSTRATIONS



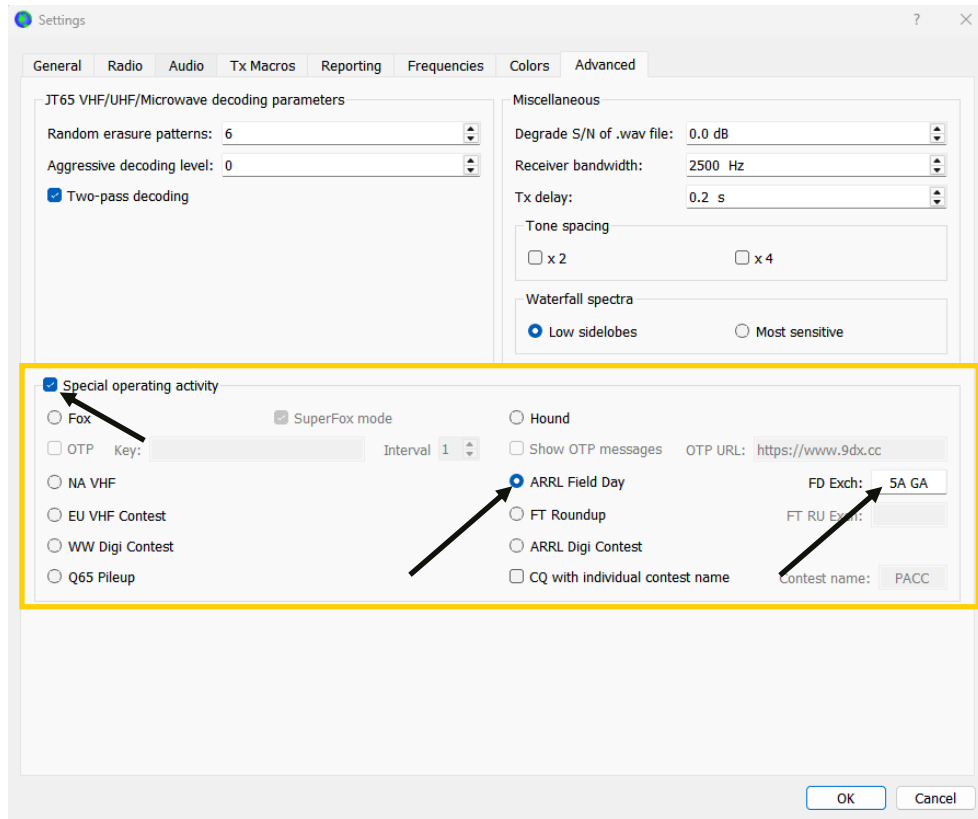
Field Day Setup



WSJT-X

File→Settings→Advanced

- Field Day setup
 - Field Day exchange consists of operating class and ARRL section
- ARRL sections,
<https://www.arrl.org/sections>
 - Look up by state
- Class consists of number of simultaneous transmitters and category
- ARRL Field Day rules,
<https://www.arrl.org/field-day-rules>



WSJT-X

Contest Log

Band	Freq(MHz)	Mode	Date & Time(UTC)
0 QSOS			

WSJT-X v2.7.0 by K1JT et al.

File Configurations View Mode Decode Save Tools Help

Band Activity

UTC	dB	DT	Freq	Message
162330	-19	0.2	1556 ~	CQ YV5JLO FK60 Venezuela
162330	-4	0.5	477 ~	CQ D2UY JI64 AF
----- 10m				
162345	-20	-1.0	1289 ~	OM5XX CX1RL R+07
----- 10m				
162400	1	0.5	477 ~	CQ D2UY JI64 AF
162400	-22	0.2	1555 ~	N4XOK YV5JLO -12
----- 10m				
162430	-2	0.5	477 ~	CQ D2UY JI64 AF
162430	-18	0.2	1555 ~	N4XOK YV5JLO RR73
----- 10m				
162445	-11	0.1	1706 ~	CQ CX3DDO GF15 CQ Zone 13
162445	-16	-1.0	1288 ~	CQ CX1RL GF25 CQ Zone 13
----- 10m				
162500	-19	0.2	1555 ~	CQ YV5JLO FK60 Venezuela
162500	-7	0.5	477 ~	CQ D2UY JI64 AF
----- 10m				
162515	-23	0.1	1706 ~	TA3D CX3DDO -17
----- 10m				
162530	-5	0.5	477 ~	CQ D2UY JI64 AF
162530	-20	0.2	1555 ~	CQ YV5JLO FK60 Venezuela

Rx Frequency

UTC	dB	DT	Freq	Message
160630	-18	0.3	1840 ~	EA3GNL V31DL EK57
160700	-21	0.3	1840 ~	KJ5ITV V31DL EK57
160730	-24	0.3	1840 ~	KJ5ITV V31DL EK57
160800	-24	0.3	1840 ~	KJ5ITV V31DL EK57
160830	-14	0.3	1840 ~	KJ5ITV V31DL EK57
160930	-20	0.3	1841 ~	CQ V31DL EK57 Belize
161000	-13	0.3	1841 ~	TA1EVR V31DL R-14
161030	-17	0.3	1840 ~	TA1EVR V31DL R-14
161100	-17	0.3	1840 ~	TA1EVR V31DL R-14
161130	-13	0.3	1840 ~	TA1EVR V31DL R-14
161200	-11	0.3	1840 ~	CQ V31DL EK57 Belize
161230	-19	0.3	1840 ~	TA1EVR V31DL R-14
161300	-11	0.3	1840 ~	TA1EVR V31DL R-14
161330	-17	0.3	1841 ~	TA1EVR V31DL R-14
161430	-16	0.3	1840 ~	CQ V31DL EK57 Belize
161500	-11	0.3	1840 ~	CQ V31DL EK57 Belize
161615	-11	0.3	1840 ~	CQ V31DL EK57 Belize
161645	-9	0.2	1840 ~	CQ V31DL EK57 Belize
161745	-10	0.2	1840 ~	CQ V31DL EK57 Belize
161800	-16	0.2	1840 ~	KC5UZI V31DL -07
161830	-15	0.2	1840 ~	KC5UZI V31DL RR73

☐ CQ only ☒ Menus

10m ☒ 28.074 000 ☐ Tx even/1st ☒ Hold Tx Freq

Tx 1500 Hz

Rx 1841 Hz

Report -24 ☒ Auto Seq CQ: None

Generate Std Msgs

V31DL KB4DSF EM91	<input checked="" type="radio"/> Tx 1
V31DL KB4DSF 5A GA	<input type="radio"/> Tx 2
V31DL KB4DSF R 5A GA	<input type="radio"/> Tx 3
V31DL KB4DSF RR73	<input type="radio"/> Tx 4
V31DL KB4DSF 73	<input type="radio"/> Tx 5
CQ FD KB4DSF EM91	<input type="radio"/> Tx 6

Receiving FT8 2 5/15 WD:6m



Next Month On the Air Live
June 24 @8pm Eastern
Fox Hunting



Thank You!



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